

**Instructor:** Xiaohua Li  
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**Office Hours:** MF 11:00am-1:00pm & W 12:00pm-1:00pm or by appointment.

**Lecture Time:** MF 10:00am-10:50am & W 10:00am-11:50am room B140

**Required Textbook:** Advanced Engineering Mathematics, 10<sup>th</sup> edition  
Erwin Kreyszig  
ISBN-10: 0470458364  
ISBN-13: 978-0470458365

**Course Description:**

Applications of mathematical methods and computational techniques to typical problems in mechanical and energy engineering practice. Topics include vector calculus, numerical methods and probability and statistics.

**Pre-requisites:** MATH 2730.

**Course Learning Outcomes (CLO):**

Upon successful completion of this course, students will be able to:

1. Understand vectors and their operations in 2D and 3D space
2. Calculate vector integrals: line integrals, surface integrals and volume integrals
3. Find roots for algebra equation using Iterative method and Newton's method
4. Understand Lagrange, Newton and Spline interpolation method
5. Find numerical value for integration using Trapezoidal and Simpson's method
6. Solve linear equations using Gaussian elimination method and LU method
7. Solve ODE using Euler method and R-K method
8. Understand the basic idea of Galerkin and FEM method
9. Understand most common statistics distributions
10. Find the confidence interval of population mean and population proportion
11. Testing of Hypothesis for large and small samples

CLO	ABET Student Outcomes (SO)										
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	SO8	SO9	SO10	SO11
1	X				X				X		
2	X				X				X		
3	X				X				X		
4	X				X				X		
5	X				X				X		
6	X				X				X		
7	X				X				X		
8	X				X				X		
9	X				X				X		
10	X				X				X		
11	X				X				X		

<b>Grades:</b> Homework	15%	$\geq 85$	A
Pop Quizzes	10%	70-84.9	B
Exam#1	25%	55-69.9	C
Exam#2	25%	40-54.9	D
Final	25%	< 40	F

**Homework:** Please turn in your homework on the due day. NO delayed homework will be collected.

**Exam and Quiz:** quizzes are open book and notes. Exams are closed book closed notes with one page of formula sheet (A4 size, both sides). **There will be NO make-up exam/quiz.** Only students who missed an exam with valid excuse (for instances: medical emergency of him/herself and close relatives, with valid hospital records or doctor's note) will be given make-up exam.

**Disability Accommodations:** If you need academic accommodations for disability you must have document which verifies the disability and makes you eligible for accommodations, then you can schedule an appointment with the instructor to make appropriate arrangements.

**Academic Dishonesty:**

There is a zero tolerance policy. Cheating of whatsoever will result in an automatic 'F' in this course and the matter will be turned over to the appropriate student disciplinary committee.

**EXAM DATES**

**Exam #1 on Wednesday, October 5<sup>th</sup>, 2011 from 10:00am-12:00pm**

**Exam #2 on Wednesday, November 9<sup>th</sup>, 2011 from 10:00am-12:00pm**

**Final Exam TBD**

## MEEN 3250.002

### Analytical Methods for MEE Engineers Schedule Overview

(Please note the schedule may change based on the needs during the semester)

Week	Date	Monday (50mins)	Wednesday (1h50mins)	Friday (50mins)	HW Due
#1	Aug.25 <sup>th</sup> - Aug.26 <sup>th</sup>	-	-	Course overview, 9.1 Vectors in 2-Space and 3- Space	09/09
#2	Aug.29 <sup>th</sup> - Sept.2 <sup>nd</sup>	9.2 Inner Product 9.3 Cross Product	9.4 Vector and Scalar Functions and Fields. Derivatives	Curves. Arc Length. Curvature. Torsion	09/09
#3	Sept.5 <sup>th</sup> - Sept.9 <sup>th</sup>	NO CLASS (Labor Day)	Calculus Review: Functions of Several Variables;  Gradient of a Scalar Field; directional derivatives, tangent planes;	extrema of functions of several variables; Lagrange multipliers	09/16
#4	Sept.12 <sup>th</sup> - Sept.16 <sup>th</sup>	Divergence of a Vector Field Curl of a Vector Field	10.1 Line Integrals 10.2 Path Independence of Line Integrals	10.3 Calculus Review: Double Integrals	09/23
#5	Sept.19 <sup>th</sup> - Sept.23 <sup>rd</sup>	10.4 Green's Theorem in the Plane	10.5 Surfaces for Surface Integrals 10.6 Surface Integrals	10.7 Triple Integrals. Divergence Theorem of Gauss	09/30
#6	Sept.26 <sup>th</sup> - Sept.30 <sup>th</sup>	10.8 Further Applications of the Divergence Theorem	10.9 Stokes's Theorem  Review of vector calculus	Part III: Numerical methods: Read 19.1;  19.2 Solution of Equations by Iteration (Newton, Secant, Fixed- point)	10/07
#7	Oct. 3 <sup>rd</sup> - Oct.7 <sup>th</sup>	19.2 Solution of Equations by Iteration (Newton, Secant, Fixed-point)	Exam #1-vector calculus (see below for exact date)	19.3 Interpolation: Lagrangian; Divided difference;	10/14

#8	Oct. 10 <sup>th</sup> – Oct.14 <sup>th</sup>	19.4: Spline interpolation	19.5 Numerical integration: rectangular, trapezoidal; Simpson rules (1/3,3/8): Numerical differentiation	20.1 linear system: Gauss elimination	10/21
#9	Oct. 17 <sup>th</sup> – Oct.21 <sup>st</sup>	20.2 linear system: LU factorization; Cholesky method	20.3 solution by Gauss-Seidel Iteration; Norm; ill-condition matrix	20.6 Eigenvalues 20.8 power method for Eigenvalues	10/28
#10	Oct. 24 <sup>th</sup> – Oct.28 <sup>th</sup>	21.1 Euler method; improved Euler method	R-K method RKF method Backward Euler method	21.2 multistep methods: Adam-Bashforth and Adam-moulton method	11/04
#11	Oct.31 <sup>st</sup> –Nov.4 <sup>th</sup>	21.3 Methods for higher order ODEs; Euler method; 4 <sup>th</sup> order RK	Handout: Boundary-value problem: Galerkin Method; FEM	Part III: Statistics 24.1 data representation, experiments, probability, basic theorems	11/11
#12	Nov.7 <sup>th</sup> –Nov.11 <sup>th</sup>	24.5 RV, pdf; 24.6 mean, Variance	Exam #2- Numerical methods	24.7 Binomial, Poisson distribution	11/18
#13	Nov.14 <sup>th</sup> –Nov.18 <sup>th</sup>	24.8 Normal distribution	24.9 Distribution of several RV: discrete/continuous, marginal, dependence, addition rules	25.2 point estimation 25.3 confidence interval: Large sample size, Small sample size	11/23
#14	Nov.21 <sup>st</sup> –Nov.25 <sup>th</sup>	25.3 confidence interval: Small sample size	25.3 Confidence interval: population proportion	NO Class (Thanks-giving)	N/A
#15	Nov.28 <sup>th</sup> – Dec. 2 <sup>nd</sup>	25.4 Hypothesis testing: large sample mean, p-value;	Hypothesis testing: p-value;	25.4 Hypothesis testing: Small sample mean;	12/07
#16	Dec. 5 <sup>th</sup> – Dec.9 <sup>th</sup>	25.4 Hypothesis testing: Large sample population proportion	Review	-	N/A